

**IFA**

Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

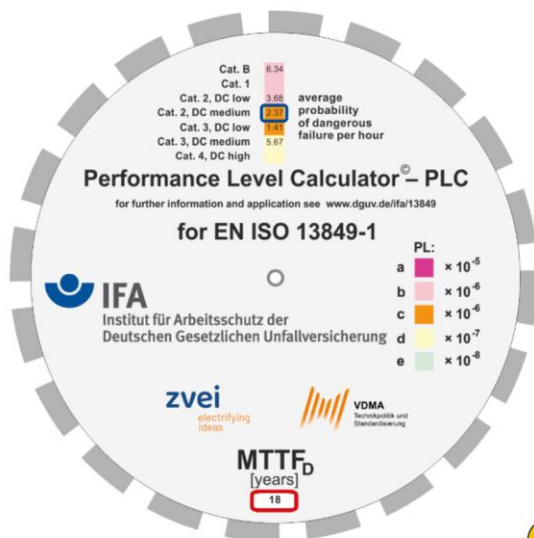
Performance Level Calculator – PLC

Web application to determine the performance level according to EN ISO 13849-1

Do you need practical help in developing safety-related control systems?

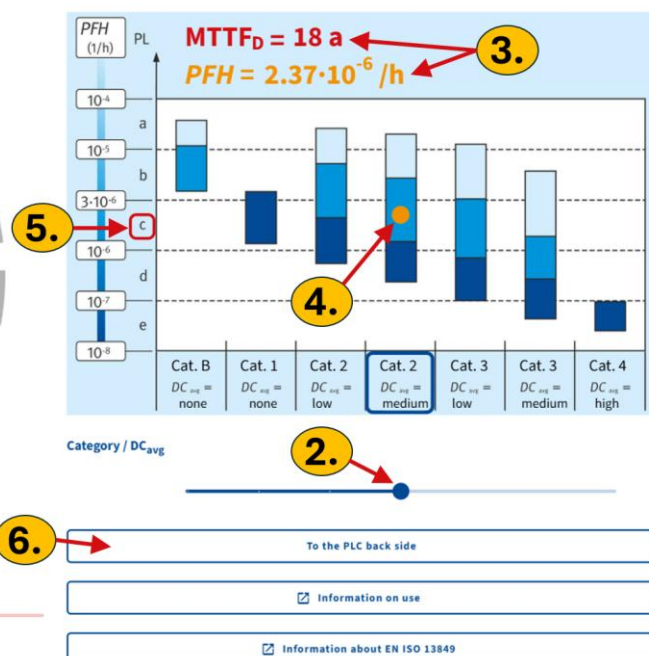
The EN ISO 13849 series of standards describes simple methods for evaluating safety-related control systems for machines. The established PLC disc supports you in estimating the probability of dangerous failure as described in the standard – now also available in digital form as a web application.

PLC disc



MTTF_D [years]

Bar chart according to EN ISO 13849-1



How is the web application used?

You can easily determine the average frequency of a dangerous failure per hour (PFH) and the corresponding Performance Level (PL) by using the red slider (1.) to set the desired mean time to dangerous failure (MTTF_D) for a single channel. Using the blue slider (2.), you can then select the appropriate bar as a combination of the desired category (Cat.) and

diagnostic coverage (DC) for fault detection. The selected $MTTF_D$ and the resulting PFH value (3.) are displayed in the upper section of the bar chart and marked by an orange dot (4.) on the corresponding bar. This illustrates where you are on the PL scale and what impact variations in the selected parameters might have. The corresponding performance level is marked on the vertical axis of the bar chart (5.). Using the “To the PLC back side” button (6.), you can select $MTTF_D$ values greater than 100 years for category 4.

PLC disc as rotatable discs

For the paper version of the disc: <https://www.dguv.de/ifa/praxishilfen/praxishilfen-maschinenschutz/performance-level-calculator/index.jsp>

Background

EN ISO 13849-1 formulates requirements that facilitate the development, validation, and certification of safety-related machine control systems. The standard combines deterministic and probabilistic requirements in a manner suitable for practical application: the category, representing the structure of a control system (e.g., with redundancy and testing), and its probabilistic properties (mean time to dangerous failure of components: $MTTF_D$, diagnostic coverage of fault detection: DC) are incorporated into the determination of the Performance Level (PL). Markov models have been used as a mathematical method to determine the average frequency of a dangerous failure per hour (PFH) from the numerous input variables. The resulting relationships between the input variables – category, DC and $MTTF_D$ – are presented in the standard in simplified form as a bar chart and as table values. The disc simplifies use of these values and makes them comparable. It serves to quickly assess which combinations of input variables are suitable for a specific required PL.

Additional information and ordering

IFA's internet site: <https://www.dguv.de/ifa/13849>

Expert assistance: Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA)
Accident Prevention: Digitalization – Technologies
Alte Heerstraße 111, 53757 Sankt Augustin, Germany
Phone: +49 30 13001-3500, Fax: +49 30 13001-38001

Note:

The IFA supports the German Statutory Accident Insurance Institutions and their organisations particularly in solving scientific and technical problems relating to safety and health protection at work; the IFA does so by means of:

- research, development, and investigations
- testing of products and material samples
- workplace measurements and advice
- participation in standardization and regulation-setting bodies
- technical information and expertise

In addition, the IFA works on behalf of manufacturers and companies within the framework of

- product testing and certification
- certification of quality management systems